

Claims

- [c1] 1. A method for operating an exhaust gas purification system, said method comprising:
directing heated fuel from a high pressure fuel injection system to a reductant source;
heating frozen reductant within the reductant source with thermal energy transferred from the heated fuel; and
supplying the reductant to an exhaust gas pipe in front of a catalyst for purification of exhaust gas.
- [c2] 2. The method of claim 1 wherein the reductant source is a reservoir within a heat exchanger.
- [c3] 3. The method of claim 1 wherein the reductant source is a reductant supply line contained within a high pressure fuel injection system return line.
- [c4] 4. The method of claim 1 wherein the high pressure fuel injection system is a common rail fuel injection system.
- [c5] 5. The method of claim 1 wherein a reductant tank to supply reductant to the reductant source is positioned in a vehicle in a location capable of being exposed to heat generated during vehicle operation and protected from direct exposure to ambient temperatures.
- [c6] 6. The method of claim 5 wherein the reductant tank is located within a fuel tank.
- [c7] 7. The method of claim 1 wherein the reductant is an aqueous urea solution.
- [c8] 8. The method of claim 1 further comprising system components containing the reductant, wherein the components are made from an elastic material with an expansion coefficient higher than the expansion coefficient of the reductant to prevent damage to the components when the reductant freezes.
- [c9] 9. A system for use with the method of claim 1, said system comprising:
a source of fuel:

a first source of liquid reductant;
an exhaust pipe for discharging exhaust gas from the vehicle;
a second source of liquid reductant, the second source being disposed between the first source of liquid reductant and the exhaust pipe;
a high pressure fuel injection system disposed between the fuel source and the second liquid reductant source;
a first conduit fluidly connecting the fuel source with the high pressure fuel injection system;
a second conduit fluidly connecting the high pressure injection system with the fuel source;
a third conduit fluidly connecting the first liquid reductant source with the exhaust pipe;
a first high pressure fuel pump to deliver fuel from the fuel source through the high pressure fuel injection system, past the second liquid reductant source, returning to the fuel source, whereby compression of the fuel in the high pressure fuel injection system heats the fuel; and
a second pump to deliver liquid reductant from the second liquid reductant source to the exhaust pipe.

- [c10] 10. The system of claim 9 wherein the second liquid reductant source is a reservoir within a heat exchanger.
- [c11] 11. The system of claim 9 wherein the second liquid reductant source is a reductant supply line contained within a high pressure fuel injection system return line.
- [c12] 12. The system of claim 9 wherein the high pressure fuel injection system is a common rail injection system.
- [c13] 13. The system of claim 9 further comprising a reductant tank containing the source of liquid reductant wherein the reductant tank is positioned in a vehicle in a location capable of being exposed to heat generated during vehicle operation and protected from direct exposure to ambient temperatures.
- [c14] 14. The system of claim 9 further comprising a fuel tank containing the source

of fuel and a reductant tank containing the source of liquid reductant, wherein the reductant tank is located within the fuel tank.

[c15] 15. The system of claim 9 wherein the liquid reductant is an aqueous urea solution.

[c16] 16. The system of claim 9 further comprising system components containing the reductant, wherein the components are made from an elastic material with an expansion coefficient higher than the expansion coefficient of the reductant to prevent damage to the components when the reductant freezes.

[c17] 17. A system for operating an exhaust gas purification system, said system comprising:
a source of fuel;
a first source of liquid reductant;
an exhaust pipe for discharging exhaust gas from the vehicle;
a second source of liquid reductant, the second source being disposed between the first source of liquid reductant and the exhaust pipe;
a high pressure fuel injection system disposed between the fuel source and the second liquid reductant source;
a first conduit fluidly connecting the fuel source with the high pressure fuel injection system;
a second conduit fluidly connecting the high pressure injection system with the fuel source;
a third conduit fluidly connecting the first liquid reductant source with the exhaust pipe;
a first high pressure fuel pump to deliver fuel from the fuel source through the high pressure fuel injection system, past the second liquid reductant source, returning to the fuel source, whereby compression of the fuel in the high pressure fuel injection system heats the fuel; and
a second pump to deliver liquid reductant from the second liquid reductant source to the exhaust pipe.

[c18] 18. The system of claim 17 wherein the second liquid reductant source is a reservoir within a heat exchanger.

- [c19] 19. The system of claim 17 wherein the second liquid reductant source is a reductant supply line contained within a high pressure fuel injection system return line.
- [c20] 20. The system of claim 17 further comprising a fuel tank containing the source of fuel and a reductant tank containing the source of liquid reductant, wherein the reductant tank is located within the fuel tank.